CALIFORNIA BUILDING STANDARDS COMMISSION

AD HOC SEISMIC ADVISORY BODY RECOMMENDATIONS

FOR

SEISMIC CORRECTIONS

TO

THE 2001 CALIFORNIA BUILDING CODE

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(TUCP)
ITEM 1: ADOPT NEW DEFINITION FOR "LIGHT-FRAME CONSTRUCTION" AS FOLLOWS:

CHAPTER 2 -- DEFINITIONS

SECTION 213 -- L

Light-Frame Construction *is a type of construction whose vertical and horizontal structural elements are primarily framed by a system of repetitive wood or light gauge steel framing members, and which does not use structural concrete as floor or roof diaphragm.*

Reason for amendment:

The 1997 UBC, on several occasions, refers to "Light-Frame" construction. However, currently there is no definition for the term. The proposal inserts new language, similar to the provided in IBC, for additional clarification.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mine and Geology. Recent earthquake activities, including the 1989 Loma Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(LARUCP)
ITEM 2: AMEND SECTION 1612.2.1 – BASIC LOAD COMBINATIONS AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1612 – COMBINATION LOADS
1612.1 General. …
1612.2 Load Combinations Using Strength Design or Load and Resistance Factor Design.

1612.2.1 Basic load combinations. Where Load and Resistance Factor Design (Strength Design) is used, structures and all portions thereof shall resist the most critical effects from the following
combinations of factored loads:

1.*4D*	(12-1)
1.*2D* + 1.6*L* + 0.5 *(L_r* or *S*)	(12-2)
1.*2D* + 1.6 *(L_r* or S) + *(*f₁ *L* or 0.8 *W*)	(12-3)
1.*2D* + 1.*3W* + *(*f₁ *L* + 0.5 *(L_r* or *S*)	(12-4)
~~1.*2D* + 1.0*E* + *(*f₁ *L* + f₂ *S*)~~	~~(12-5)~~
1.*2D* ± 1.0*E* + *(*f₁ *L* + f₂ *S*)	(12-5)
~~0.*9D* ± (1.*0E* or 1.*3W*)~~	~~(12-6)~~
0.*9D* ± (1.0*?E_h* or 1.*3W*)	(12-6)

WHERE:
f_1 = 1.0 for floors in places of public assembly, for live loads in excess of 100 psf (4.9 kN/m^2), and for garage live load.
= 0.5 for other live loads.
f_2 = 0.7 for roof configurations (such as saw tooth) that do not shed snow off the structure.
= 0.2 for other roof configurations.
EXCEPTIONS: 1. Factored load combinations for concrete per Section 1909.2 where load combinations do not include seismic forces.
2. ~~Factored load combinations of this section multiplied by 1.1 for concrete and masonry where load combinations include seismic forces.~~
~~3.~~ Where other factored load combinations are specifically required by the provisions of this code.

Reasons for Amendment/Interpretation/Clarification:

a. The amendment changes the quantity “E” in Eq. (12-6) to “?E_h" to avoid reduction of 0.9D by E_v. The effect of vertical earthquake ground motion is adequately accounted for in Eq. (12-5). Justification is provided in SEAOC 1999 Blue Book Commentary C101.7.1 (page. 85). This is consistent with California amendments.

b. The1.1 factor for concrete and masonry when applied, requires the amount of flexural reinforcement to increase more than the increase for shear. This increase will result in shear walls with undesirable shear-critical behavior. This may cause brittle shear failure in reinforced concrete and masonry shear walls. A corresponding adjustment is required when the Alternate Load-Factor Combination and Strength Reduction Factors in Division VIII is used. This is consistent with California amendments.

Findings:
Local Geological Conditions - Results from studies after the Northridge Earthquake.

(TUCP)
ITEM 3: AMEND SECTION 1612.3.2 – ALTERNATE BASIC LOAD COMBINATIONS:

Chapter 16 -- STRUCTURAL DESIGN REQUIRMENTS

SECTION 1612 – COMBINATION LOADS

1612.3 Load Combinations Using Allowable Stress Design
1612.3.1 Basic load combinations. ….

1612.3.2 Alternate basic load combinations. In lieu of the basic load combinations specified in Section 1612.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following load combinations. When using these alternate basic load combinations, a one-third increase shall be permitted in allowable stresses for all combinations including *W* or *E*. ~~–~~but not concurrent with the duration of load increase permitted in Division III of Chapter 23.

$D + L + (L_r$ or S)	(12-12)
$D + L + (W$ or $E/1.4)$	(12-13)
$D + L + W + S/2$	(12-14)
$D + L + S + W/2$	(12-15)
$D + L + S + E/1.4$	(12-16)
$0.9D \pm E/1.4$	(12-16-1)

EXCEPTIONS: 1. Crane hook loads need not be combined with roof live load or with more than three fourths of the snow load or one half of the wind load.
2. Design snow loads of 30 psf (1.44 kN/m ^{2}) or less need not be combined with seismic loads. Where design snow loads exceed 30 psf (1.44 kN/m ^{2}), the design snow load shall be included with seismic loads, but may be reduced up to 75 percent where consideration of siting, configuration and load duration warrant when approved by the building official.

Reason for amendment:

The proposal clarifies that it was not the intent of the code to allow the one-third increase for wind or earthquake to be cumulative with duration of load factors as permitted in chapter 23 of UBC, since these factors essentially represent the same allowance.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California

Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(LARUCP)
ITEM 4: AMEND SECTION 1629.4.2 – SEISMIC ZONE 4 NEAR-SOURCE FACTOR AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1629 – CRITERIA SELECTION

1629.1 Basis for design. …
1629.2 Occupancy categories. …
1629.3 Site Geology and soil characteristics. …

1629.4 Site Seismic Hazard Characteristics. …
1629.4.1 Seismic Zone. …

1629.4.2. Seismic Zone 4 near-source factor. In Seismic Zone 4, each site shall be assigned a near-source factor in accordance with Table 16-S and the Seismic Source Type set forth in Table 16-U. The value of N_a used in determining C_a need not exceed 1.1 for structures complying with all the following conditions:

1. The soil profile type is S_A, S_B, S_C or S_D.

2. D = 1.0.

3. Except in single-story structures, Group R, Division 3 and Group U, Division 1 Occupancies, moment frame systems designated as part of the lateral-force-resisting system shall be special moment-resisting frames.

4. The provisions in ~~exceptions to Section 2213.7.5~~ Sections 9.6a and 9.6b of AISC - Seismic Part I shall not apply, except for columns in one-story buildings or columns at the top story of multistory buildings.

5. None of the following structural irregularities is present: Type 1, 4 or 5 of Table 16-L, and Type 1 or 4 of Table 16-M.

Reasons for Amendment/Interpretation/Clarification:

The amendment is needed due to local geologic conditions. The Los Angeles region is a densely populated area that has buildings constructed over and near a vast and complex network of faults that are believed to be capable of producing future earthquakes similar or greater in size than the 1994 Northridge and the 1971 Sylmar earthquakes. Design provisions developed based on detailed study of the 1994 Northridge earthquake need to be incorporated into the local building codes to assure new buildings, and additions to existing buildings, are designed and constructed in accordance with the scope and objectives of the Uniform Building Code.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(TUCP)
ITEM 5: ADD NEW SECTION 1630.2.3.4 – HORIZONTAL DISTRIBUTION AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1630 – MINIMUM DESIGN LATERAL FORCES AND RELATED EFFECTS
1630.1 Earthquake Loads and Modeling Requirements. …
1630.2 Static Force Procedure.
1630.2.1 Design base shear. …
1630.2.2 Structural period. …
1630.2.3 Simplified design base shear.

1630.2.3.4 Horizontal Distribution. Diaphragms constructed of un-topped steel decking or wood structural panels or similar light-frame construction are permitted to be considered as flexible.

SECTION x7. Section 1630.2.3 of the California Building Code is amended by adding Section 1630.2.3.5 to read as follows:

~~**1630.2.3.4**~~ **1630.2.3.5 Applicability.** Sections 1630.1.2, 1630.1.3, 1630.2.1, 1630.2.2, 1630.5, 1630.9, 1630.10 and 1631 shall not apply when using the simplified procedure.

EXCEPTION: For buildings with relatively flexible structural systems, the building official may require consideration of *P?* effects and drift in accordance with Sections 1630.1.3, 1630.9 and 1630.10. $?_s$ shall be prepared using design seismic forces from Section 1630.2.3.2.

Reason for amendment:

The proposal is compatible with the current policy adopted by the Tri-Chapter jurisdictions. The assumption of flexible diaphragm is limited only to simplified procedure which requires design for additional seismic loads.

(TUCP)

ITEM 6: AMEND SECTION 1630.4.2 – VERTICAL COMBINATIONS AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

1630 – MINIMUM DESIGN LATERAL FORCES AND RELATED EFFECTS

1630.4 Combinations of Structural Systems.

1630.4.1 General. …

1630.4.2 Vertical combinations. The value of *R* used in the design of any story shall be less than or equal to the value of *R* used in the given direction for the story above.

> **EXCEPTION:** This requirement need not be applied to a story where the dead weight above that story is less than 10 percent of the total dead weight of the structure.

Structures may be designed using the procedures of this section under the following conditions:

1. The entire structure is designed using the lowest *R* of the lateral-force-resisting systems used, or
2. The following two-stage static analysis procedures may be used for structures conforming to Section 1629.8.3, Item 4.
   - 2.1 The flexible upper portion shall be designed as a separate structure, supported laterally by the rigid lower portion, using the appropriate values of *R* and ?.
   - 2.2 The rigid lower portion shall be designed as a separate structure using the appropriate values of *R* and ?. The reactions from the upper portion shall be those determined from the analysis of the upper portion ~~amplified~~ <u>multiplied</u> by the ratio of the *(R/?*) of the upper portion over *(R/?*) of the lower portion. <u>This ratio shall not be taken less than 1.0.</u>

Reason for amendment:

The proposal adds language to ensure that the seismic forces are not inadvertently reduced from a higher level to a lower level due to different lateral force resisting systems along the height of the building.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma

Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(TUCP)

ITEM 7: AMEND SECTION 1630.8.2.1 – GENERAL REQUIREMENTS FOR ELEMENTS SUPPORTING DISCONTINUOUS SYSTEMS AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1630 – MINIMUM DESIGN LATERAL FORCE AND RELATED EFFECTS

1630.8 Overturning

1630.8.1 General …

1630.8.2 Elements supporting discontinuous systems.

1630.8.2.1 General. Where any portion of the lateral-load-resisting system is discontinuous, such as for vertical irregularity Type 4 in Table 16-L or plan irregularity Type 4 in Table 16-M, concrete, masonry, steel and wood elements (i.e. columns, beams, trusses or slabs) supporting such discontinuous systems shall have the design strength to resist the combination loads resulting from the special seismic load combinations of Section 1612.4. *The Connections of such discontinued elements to the supporting members shall be adequate to transmit the forces for which the discontinuous elements were required to be designed.*

> **EXCEPTIONS:** 1. The quantity E_m in Section 1612.4 need not exceed the maximum force that can be transferred to the element by the lateral-force-resisting system.
> 2. Concrete slabs supporting light-frame wood shear wall systems or light-frame steel and wood structural panel shear wall systems.

For Allowable Stress Design, the design strength may be determined using an allowable stress increase of 1.7 and a resistance factor, Φ, of 1.0. This increase shall not be combined with the one-third stress increase permitted by Section 1612.3, but may be combined with the duration of load increase permitted in Chapter 23, Division III.

Reason for amendment:

The changes limits use of the special load combination to the primary elements of the structural frame system, thereby exempting miscellaneous components of the lateral-force resisting system (such as hold-downs) and foundations. This is consistent with intent of the Code and SEAOC Seismology Position.

The changes in italics were added by the Tri-Chapter code committee to ensure that connections of such elements to the supporting members are not designed for a load less that what the member above is designed for. For example in case of steel columns that are part of lateral force resisting system, which are designed for the special load combination, it is prudent to ensure that their connections also have sufficient capacity to transmit the load to the supporting element.

Findings (based upon local geologic, topographic or climatic conditions):
The amendment is needed due to local geological conditions.The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(LARUCP)

ITEM 8: AMEND SECTION 1630.8.2.2 – DETAILING REQUIREMENTS IN SEISMIC ZONES 3 AND 4 AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1630 – MINIMUM DESIGN LATERAL FORCES AND RELATED EFFECTS

1630.8 Overturning.
1630.8.1 General. …
1630.8.2 Elements supporting discontinuous systems.
1630.8.2.1 General. …

1630.8.2.2 Detailing requirements in Seismic Zones 3 and 4. In Seismic Zones 3 and 4, elements supporting discontinuous systems shall meet the following detailing or member limitations:

1. Reinforced concrete or reinforced masonry elements designed primarily as axial-load members shall comply with Section 1921.4.4.5.

2. Reinforced concrete elements designed primarily as flexural members and supporting other than light-frame wood shear wall systems or light-frame steel and wood structural panel shear wall systems shall comply with Sections 1921.3.2 and 1921.3.3. Strength computations for portions of slabs designed as supporting elements shall include only those portions of the slab that comply with the requirements of these Sections.

3. Masonry elements designed primarily as axial-load carrying members shall comply with Sections 2106.1.12.4, Item 1, and 2108.2.6.2.6.

4. Masonry elements designed primarily as flexural members shall comply with Section 2108.2.6.2.5.

5. ~~Steel elements designed primarily as axial-load members shall comply with Sections 2213.5.2 and 2213.5.3.~~ Not Adopted.

6. Steel elements designed primarily as flexural members or trusses shall have bracing for both top and bottom beam flanges or chords at the location of the support of the discontinuous system and shall comply with the requirements of ~~Section 2213.7.1.3.~~ AISC-Seismic Part I, Section 9.4.

7. Wood elements designed primarily as flexural members shall be provided with lateral bracing or solid blocking at each end of the element and at the connection location(s) of the discontinuous system.

Reasons for Amendment/Interpretation/Clarification:

a. It is adopted in AISC-Seismic 97 Part I, Section 8.3 and applicable to all axial loaded members. Redundant.
b. Old section no longer applicable. Replace with provision in the AISC-Seismic.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(TUCP)
ITEM 9: AMEND SECTION 1630.10.3 – LIMITATIONS AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

SECTION 1630 – MINIMUM DESIGN LATERAL FORCES AND RELATED EFFECTS

1630.10 Story Drift Limitation.
1630.10.1 General. …
1630.10.2 Calculated. …

1630.10.3 Limitations. The design lateral forces used to determine the calculated drift may disregard the limitations of Formula (30-6) ~~and (30-7) (Errata Mar. 2001)~~ and may be based on the period determined from Formula (30-10) neglecting the 30 or 40 percent limitations of Section 1630.2.2, Item 2.

Reasons for Amendment/Interpretation/Clarification:

The proposal corrects a much significant deficiency in the 97 UBC, which eliminated any minimum base shear from consideration when checking for building drift.

After engineers began using the '97 UBC they found problems with applying (30-7) for the drift calculations. (30-7) applies only to Zone 4 and was added after the Northridge Earthquake to account for near fault pulses. An erratum to '97 UBC Section 1630.10.3 was issued in March 2001, 3 years following publication, that deleted (30-7) from being applied to drift calculations. However, SEAOC Seismology Committee found that the erratum actually made the drift limit to be less stringent and would allow more slender and flexible buildings than were allowed under the '94 UBC.

The proposed modification was recommended by SEAOC Seismology Committee. It effectively makes the descending branch vary with $1/T^{2/3}$ for drift coordination purposes and make the drift limitations very similar to those of the '94 UBC.

The change from 0.7 seconds to 0.5 seconds in the proposal is needed to avoid a step function in the drift limit. If 0.7 second were retained, the drift limit at T just below 0.7 seconds would have been different from the drift limit just above 0.7 seconds. With the switch to 0.5 seconds, the drift limit just below T=0.5 seconds is the same as the drift limit just above T=0.5 seconds.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma

Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(LARUCP & TUCP)

ITEM 10: AMEND TABLE 16-N – STRUCTURAL SYSTEMS AS FOLLOWS:

CHAPTER 16 – STRUCTURAL DESIGN REQUIREMENTS

TABLE 16-N – STRUCTURAL SYSTEMS [1]

BASIC STRUCTURAL SYSTEM [2]	LATERAL-FORCE-RESISTING SYSTEM DESCRIPTION	*R*	*W.*	*HEIGHT LIMIT FOR SEISMIC ZONES 3 AND 4 (feet)* *x 304.8 for mm*
1. Bearing wall system	*1. Light-framed walls with shear panels*			
	a. Wood structural panel walls for structures three stories or less	*5.5*	*2.8*	*65*
	b. All other light-framed walls	*4.5*	*2.8*	*65*
	2. Shear walls			
	a. Concrete	*4.5*	*2.8*	*160*
	b. Masonry	*4.5*	*2.8*	*160*
	3. Light steel-framed bearing walls with tension-only bracing	*2.8*	*2.2*	*65*
	4. Braced frames where bracing carries gravity load			
	a. Steel	*4.4*	*2.2*	*160*
	b. Concrete [3]	*2.8*	*2.2*	*-*
	c. Heavy timber	*2.8*	*2.2*	*65*
2. Building frame system	*1. Steel eccentrically braced frame (EBF)*	*7.0*	*2.8*	*240*
	2. Light-framed walls with shear panels.			
	a. Wood structural panel walls for structures three stories or less	*6.5*	*2.8*	*65*
	b. All other light-framed walls	*5.0*	*2.8*	*65*
	3. Shear walls			
	a. Concrete	*5.5*	*2.8*	*240*
	b. Masonry	*5.5*	*2.8*	*160*
	4. Ordinary braced frames			
	a. Steel [6]	*5 ~~5.6~~*	*2 ~~2.2~~*	*35 [6] ~~160~~*
	b. Concrete [3]	*5.6*	*2.2*	*-*
	c. Heavy timber	*5.6*	*2.2*	*65*
	5. Special concentrically braced frames			
	a. Steel	*6.4*	*2.2*	*240*
3. Moment-resisting frame system	*1. Special moment-resisting frame (SMRF)*			
	a. Steel	*8.5*	*2.8*	*N.L.*
	b. Concrete [4]	*8.5*	*2.8*	*N.L.*
	2. Masonry moment-resisting wall frame (MMRWF)	*6.5*	*2.8*	*160*
	3. ~~Concrete i~~ Intermediate moment-resisting frame (IMRF) [5]			
	a. Steel [6]	*4.5*	*2.8*	*35 [6]*
	b. Concrete [5]	*5.5*	*2.8*	*-*
	4. Ordinary moment-resisting frame (OMRF)			
	a. Steel [6]	*3.5 ~~4.5~~*	*2.8*	*~~160~~ - [6]*
	b. Concrete [7 8]	*3.5*	*2.8*	*-*
	5. Special truss moment frames of steel (STMF)	*6.5*	*2.8*	*240*

4. Dual systems	***1. Shear walls***			
	a. Concrete with SMRF	**8.5**	**2.8**	**N.L.**
	b. Concrete with steel OMRF (Not Permitted)	**4.2**	**2.8**	**160**
	c. Concrete with concrete IMRF [5]	**6.5**	**2.8**	**160**
	d. Masonry with SMRF	**5.5**	**2.8**	**160**
	e. Masonry with steel OMRF *(Not Permitted)*	**4.2**	**2.8**	**160**
	f. Masonry with concrete IMRF [3]	**4.2**	**2.8**	**-**
	g. Masonry with masonry MMRWF	**6.0**	**2.8**	**160**
	2. Steel EBF			
	a. With steel SMRF	**8.5**	**2.8**	**N.L.**
	b. With steel OMRF *(Not Permitted)*	**4.2**	**2.8**	**160**
	3. Ordinary braced frames *(Not Permitted)*			
	a. Steel with steel SMRF	**6.5**	**2.8**	**N.L.**
	b. Steel with steel OMRF	**4.2**	**2.8**	**160**
	c. Concrete with concrete SMRF[3]	**6.5**	**2.8**	**-**
	d. Concrete with concrete IMRF[3]	**4.2**	**2.8**	**-**
	4. Special concentrically braced frames			
	a. Steel with steel SMRF	**7.5**	**2.8**	**N.L.**
	b. Steel with steel OMRF *(Not Permitted)*	**4.2**	**2.8**	**160**
	5. Steel IMRF *(Not permitted)*			
5. Cantilevered column building systems	**1. Cantilevered column elements**	**2.2**	**2.0**	**35[7]**
6. Shear wall-frame interaction systems	**1. Concrete [8]**	**5.5**	**2.8**	**160**
7. Undefined systems	**See Section 1629.6.7 and 1629.9.2**	**-**	**-**	**-**

N.L.– no limit

[1] See Section 1630.4 for combination of structural systems.
[2] Basic structural systems are defined in Section 1629.6.
[3] Prohibited in Seismic Zones 3 and 4.
[4] Includes precast concrete conforming to Section 1921.2.7.
[5] Prohibited in Seismic Zones 3 and 4, except as permitted in Section 1634.2.
[6] ~~Ordinary moment-resisting frames in Seismic Zone1 meeting the requirements of Section 2214.6 may use a R value of 8~~ Unless otherwise approved by the enforcement agency, in Seismic Zone 4 :
[6.1] Steel IMRF are permitted for buildings 35 ft. or less in height and the dead load of the roof, walls or floors not exceeding 35 psf each; or for single-story buildings 60 ft. or less in height with dead load of the roof or walls not exceeding 15 psf each where the moment joints of field connections are constructed of bolted end plates; or single-family dwellings using light frame construction with $R = 3.0$ and $\Omega_o = 2.2$.
[6.2] Steel OMRF are permitted for buildings 35 ft or less in height with the dead load of the roof, walls or floors not exceeding 15 psf each; or single-story buildings 60 ft or less in height with the dead load of the roof or walls not exceeding 15 psf each and where the moment joints of field connections are constructed of bolted end plates.
[6.3] Steel Ordinary Braced Frames are permitted for buildings 35 ft or less in height; or penthouse structures; or single-story buildings 60 ft or less in height with the dead load of the roof or walls not exceeding 15 psf. each.
[7] Total height of the building including cantilevered columns.
[8] Prohibited in Seismic Zones 2A, 2B, 3 and 4. See Section 1633.2.7.

Reasons for Amendment/Interpretation/Clarification:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements as well as the 2000 NEHRP. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)
ITEM 11: AMEND SECTION 1701.5 – TYPES OF WORK AS FOLLOWS:

CHAPTER 17 – STRUCTURAL TESTS AND INSPECTIONS

SECTION 1701 – SPECIAL INSPECTIONS

1701.1 General. …
1701.2 Special Inspectors. …
1701.3 Duties and Responsibilities. …
1701.4 Standards of Quality. …

1701.5 Types of Work.

1. Concrete. …
2. Bolts installed in concrete. …
3. Special moment-resisting concrete frame. …
4. Reinforcing steel and prestressing steel tendons. …
5. Structural welding. …

5.2 ~~**Special moment**~~ **Lateral force resisting frames.** During the welding of ~~special moment~~ lateral force resisting steel frames. In addition to Item 5.1 requirements, nondestructive testing as required by Section 1703 of this code.

Reasons for Amendment/Interpretation/Clarification:

AISC-Seismic Part I, which is adopted by the LARUCP, requires nondestructive testing for welded joints that are subject to net tensile forces in moment frames and braced frames. This amendment reconciles Section 1701.5 with AISC-Seismic for consistency.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)

ITEM 12: AMEND SECTION 1702 – STRUCTURAL OBSERVATION AS FOLLOWS:

CHAPTER 17 – STRUCTURAL TESTS AND INSPECTIONS

SECTION 1702 -- STRUCTURAL OBSERVATION

Structural observation shall be provided in Seismic Zone 3 or 4 when one of the following conditions exists:

1. The structure is defined in Table 16-K as Occupancy Category I, II or III,
2. The structure is required to comply with Section 403
3. The structure is in Seismic Zone 4 ~~N_a as set forth in Table 16-S is greater than one,~~ and a lateral design is required for the entire structure.

EXCEPTION: One- and two-story wood framed Group R, Division 3, B, F, M and S Occupancies provided the adjacent grade is not steeper than 1 unit vertical in 10 units horizontal (10% sloped).

4. When so designated by the architect or engineer of record, or
5. When such observation is specifically required by the building official.

The owner shall employ the engineer or architect responsible for the structural design, or another engineer or architect designated by the engineer or architect responsible for the structural design to perform structural observation as defined in Section 220.

The owner or owner's representative shall coordinate and call a pre-construction meeting between the engineer or architect responsible for the structural design, structural observer, contractor, affected subcontractors and deputy inspectors. The structural observer shall preside over the meeting. The purpose of the meeting shall be to identify the major structural elements and connections that affect the vertical and lateral load systems of the structure and to review scheduling of the required observations. A record of the meeting shall be included in the first report submitted to the building official.

Observed deficiencies shall be reported in writing to the owner's representative, special inspector, contractor and the building official. Upon the form prescribed by the building official, the ~~The~~ structural observer shall submit to the building official a written statement at each significant construction stage stating that the site visits have been made and identifying any reported deficiencies ~~that~~ which, to the best of the structural observer's knowledge, have not been resolved. A final report by the structural observer which states that all observed deficiencies have been resolved is required before acceptance of the work by the building official.

(LARUCP)
ITEM 13: AMEND SECTION 1703 – NONDESTRUCTIVE TESTING AS FOLLOWS:

CHAPTER 17 – STRUCTURAL TESTS AND INSPECTIONS

SECTION 1703 NONDESTRUCTIVE TESTING

In Seismic Zones 3 and 4, welded~~, fully restrained~~ connections between the primary members of ~~ordinary moment frames and special~~ ~~moment-resisting~~ lateral force resisting frames, which are subject to net tensile forces shall be tested by nondestructive methods in accordance with AISC-Seismic Part I Section 16 for compliance with approved standards and job specifications. This testing shall be a part of the special inspection requirements of Section 1701.5. A program for this testing shall be established by the person responsible for structural design and as shown on plans and specifications.

As a minimum… *(no changes to the remainder of the Section)*

REASON FOR AMENDMENT:

AISC-Seismic Part I, which is adopted by the LARUCP, requires nondestructive testing for welded joints that are subject to net tensile forces in moment frames and braced frames. This amendment reconciles Section 1703 with AISC-Seismic for consistency.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(TUCP)
ITEM 14: AMEND SECTION 1915.2.2 – LOAD COMBINATIONS FOR FOOTINGS AS FOLLOWS:

CHAPTER 19 - CONCRETE

SECTION 1915 – FOOTINGS
1915.0 Notations. …
1915.1 Scope. …
1915.2 Loads and reactions.
…

1915.2.2 Base area of footing or number and arrangement of piles shall be determined from the external forces and moments (transmitted by footing to soil or piles) and permissible soil pressure or permissible pile capacity selected through principles of soil mechanics. ~~*External forces and moments are those resulting from unfactored loads (D, L, W and E) specified in Chapter 16.*~~ External forces and moments are those resulting from the load combinations of Section 1612.3.

Reason for amendment:

The proposal corrects the existing code language for the design of footings for ASD criteria. The current language specifies unfactored loads, whereas, in ASD design there are some load factors that need to be considered.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma Prieta earthquake, have indicated the lack of adequate design and detailing as a contributing factor to damages that reduced the protection of the life-safety of building occupants.

(LARUCP)
ITEM 15: AMEND SECTION 198.1.2.3 – BASIC LOAD COMBINATIONS AS FOLLOWS:

CHAPTER 19 - CONCRETE

SECTION 1928 – ALTERNATE LOAD-FACTOR COMBINATION AND STRENGTH REDUCTION FACTORS

1928.1 General. …
1928.1.1 Alternate strength reduction factors. …
1928.1.2 Alternate load-factor combinations.
1928.1.2.1 Symbols and notations. …
1828.1.2.2 Combining loads using strength design.

1928.1.2.3 Basic combinations. When permitted by Section 1928.1, structures, components and foundations shall be designed so that their design strength exceeds the effects of the factored loads in the following combinations:

1. 1.4*D*
2. 1.2*D* + 1.6*L* + 0.5(L_r or *S* or R)
3. 1.2*D* + 1.6(L_r or *S* or R) + (0.5*L* or 0.8W)
4. 1.2*D* + 1.3*W* + 0.5*L* + 0.5(L_r or *S* or R)
5. ~~1.2*D* + 1.5*E* + (0.5*L* or 0.2S)~~
5. 1.2*D* ± 1.0*E* + (0.5*L* or 0.2S)
6. ~~0.9*D* – (1.3*W* or 1.5E)~~
6. 0.9*D* ± (1.3*W* or 1.0E)

EXCEPTIONS: 1. The load factor on *L* in combinations 3, 4 and 5 shall equal 1.0 for garages, areas occupied and places of public assembly, and all areas where the live load is greater than 100 lb./ft.^{2} (pounds-force per square foot) (4.79 kPa).

2. Each relevant strength limit state shall be considered. The most unfavorable effect may occur when one or more of the contributing loads are not acting.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

To correct errors caused by 1997 UBC adoption process of using various editions of the ACI vs. ASCE 7. It was reported in various papers and consensus reached. The latest national standards such as ACI 318-99, ASCE 7-98 and NEHRP 2000 have since corrected this inadvertent editorial error. This change is associated with change in Sections 1612.2.1. The earthquake load factor was adjusted to 1.0 to be consistent with Chapter 16 where the earthquake force is at the strength design level.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)
ITEM 16: AMEND SECTION 2204 – DESIGN METHODS AS FOLLOWS:

CHAPTER 22 – STEEL

SECTION 2204—DESIGN METHODS

Design shall be by one of the following methods.

2204.1 Load and Resistance Factor Design. Steel design based on load and resistance factor design methods shall resist the factored load combinations of Section 1612.2 in accordance with the applicable requirements of Section 2205. ~~Seismic design of structures, where required, shall comply with Division IV for structures designed in accordance with Division II (LRFD).~~

2204.2 Allowable Stress Design. Steel design based on allowable stress design methods shall resist the factored load combinations of Section 1612.3 in accordance with the applicable requirements of Section 2205. ~~Seismic design of structures, where required, shall comply with Division V for structures designed in Accordance with Division III (ASD).~~

Reasons for Amendment/Interpretation/Clarification:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)
ITEM 17: ADOPT NEW DIVISION IV – SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS AS FOLLOWS:

CHAPTER 22 – STEEL

DIVISION I

SECTION 2205 – DESIGN AND CONSTRUCTION PROVISIONS
2205.1 General. …
2205.2 Structural Steel Construction. …
2205.3 Seismic Design Provisions for Structural Steel. Steel structural elements that resist seismic forces shall, in addition to the requirements of Section 2205.2 be designed in accordance with Division IV ~~or V~~.

DIVISION II – DESIGN STANDARDS FOR LOAD AND RESISTANCE FACTOR DESIGN SPECIFICATION FOR STRUCTURAL WELDED STEEL BUILDINGS

…

DIVISION III – DESIGN STANDARD FOR SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS ALLOWABLE STRESS DESIGN AND PLASTIC DESIGN

…

REPEAL: Divisions IV and V of Chapter 22 of the 2001 California Building Code in their entirety and adopt new Division IV as follows:

Division IV — SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS

Based on Seismic Provisions for Structural Steel Buildings, of the American Institute of Steel Construction. Parts I and III, dated April 15, 1997 and Supplement No. 2, dated November 10, 2000.

2210 — ADOPTION
Except for the modifications as set forth in Sections 2211 and 2212 of this division and the requirements of the Building Code, the seismic design, fabrication, and erection of structural steel shall be in accordance with the *Seismic Provisions for Structural Steel Buildings*, April 15, 1997 published by the American Institute of Steel Construction, 1 East Wacker Drive, Suite 3100, Chicago, IL 60601, as if set out at length herein. The adoption of *Seismic Provisions for Structural Steel Buildings* in this Division, hereinafter referred to as AISC-Seismic, shall include Parts I (LRFD), ~~and Part~~ III (ASD)~~.~~ and Supplement No. 2, dated November 10, 2000.

Where other codes, standards, or specifications are referred to in this specification, they are to be considered as only an indication of an acceptable method or material that can be used with the approval of the Building Official.

2211 – DESIGN METHODS

When the load combinations from Section 1612.2 for LRFD are used, structural steel buildings shall be designed in accordance with Chapter 22 Division II (AISC-LRFD) and Part I of AISC-Seismic as modified by this Division.

When the load combinations from Section 1612.3 for ASD are used, structural steel buildings shall be designed in accordance with Chapter 22 Division III (AISC-ASD) and Part III of AISC-Seismic as modified by this Division.

2212 - AMENDMENTS

The AISC-Seismic adopted by this Division apply to the seismic design of structural steel members except as modified by this Section.

The following terms that appear in AISC-Seismic shall be taken as indicated in the 1997 Uniform Building Code.

AISC-Seismic	1997 Uniform Building Code
Seismic Force Resisting System	Lateral Force Resisting System
Design Earthquake	Design Basis Ground Motion
Load Combinations Eqs. (4-1) and (4-2)	Chapter 16 Eqs. (12-17) and (12-18) respectively
LRFD Specification Section Eqs. (A4-1) through (A4-6)	Chapter 16 Eqs. (12-1) through (12-6) respectively
S_oQ_E	E_m

1. Part I, Sec. 1. of the AISC Seismic Provisions is revised as follows:

1. SCOPE

These provisions are intended for the design and construction of structural steel members and connections in the Seismic Force Resisting Systems in buildings for which the design forces resulting from earthquake motions have been determined on the basis of various levels of energy dissipation in the inelastic range of response. These provisions shall apply to buildings in Seismic Zone 2 with an importance factor I greater than one, in Seismic Zone 3 and 4 or when required by the Engineer of Record.

These provisions shall be applied in conjunction with, Chapter 22, Division II, hereinafter referred to as the LRFD Specification. All members and connections in the Lateral Force Resisting System shall have a design

strength as provided in the LRFD Specification to resist load combinations 12-1 through 12-6 (in Chapter 16) and shall meet the requirements in these provisions.

Part I includes a Glossary, which is specifically applicable to this Part, and Appendix S.

2. Part I, Sec. 4.1. of the AISC Seismic Provisions is revised as follows:

4.1 Loads and Load Combinations

The loads and load combinations shall be those in ~~LRFD Specification Section A4.1~~ Section 1612.2 except as modified throughout these provisions.

Reasons for Amendment/Interpretation/Clarification:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

Findings:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)
ITEM 18: ADD NEW SECTION 2315.5.6 – HOLD DOWN CONNECTORS AS FOLLOWS:

CHAPTER 23 -- WOOD

SECTION 2315 – WOOD SHEAR WALLS AND DIAPHRAGMS

2315.1 General. …
2315.2 Wood Members Resisting Horizontal Forces Contributed to Masonry and Concrete. …
2315.3 Wood Diaphragms. …
2315.4 Particleboard Diaphragms. …

2315.5 Wood Shear Walls and Diaphragms in Seismic Zones 3 and 4.

2315.5.6 Hold-down connectors. Hold-down connector bolts into wood framing require steel plate washers in accordance with Table 23-II-L. Hold-downs shall be re-tightened just prior to covering the wall framing.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(LARUCP)
ITEM 19: ADD NEW TABLE 23-II-L – MINIMUM SIZE STEEL PLATE WASHERS USED WITH HOLD DOWN CONNECTORS AS FOLLOWS:

CHAPTER 23 – WOOD

Table 23-II-L MINIMUM SIZE STEEL PLATE WASHERS USED WITH HOLDDOWN CONNECTORS

Bolt Size	Plate Size
x 25.4 for mm	x 25.4 for mm
1/2 in	3/16" x 2" x 2"
5/8 in	1/4" x 2-1/2" x 2-1/2"
3/4 in	5/16" x 2-3/4" x 2-3/4"
7/8 in	5/16" x 3" x 3"
1 in	3/8" x 3-1/2" x 3-1/2"

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

(TUCP)
ITEM 20 – ADOPT 1997 NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION AS FOLLOWS:

CHAPTER 23 - WOOD

Division III-DESIGN SPECIFICATIONS FOR ALLOWABLE STRESS DESIGN OF WOOD BUILDINGS

Part I-ALLOWABLE STRESS DESIGN OF WOOD

This standard, with certain exceptions, is the ANSI/NFoPA ~~NDS-91~~ NDS-97 National Design Specification for Wood Construction of the American Forest and Paper Association, ~~Revised 1991~~ 1997 Edition, and the Supplement to the ~~1991~~ 1997 Edition, National Design Specification, adopted by reference.

The National Design Specification for Wood Construction, ~~Revised 1991~~ 1997 Edition, and supplement are available from the American Forest and Paper Association, 1111 19th Street, NW, Eighth Floor, Washington, DC, 20036.

SECTION 2316 - DESIGN SPECIFICATIONS

2316.1 Adoption and Scope. The National Design Specification for Wood Construction, ~~Revised 1991~~ 1997 Edition (NDS), which is hereby adopted as a part of this code, shall apply to the design and …

2316.2 Amendments.

12. ~~Sec 3.2.3.2~~ Sec. 3.2.3.3. Add to end of paragraph as follows: Cantilevered portions of beams less than 4 inches (102 mm) in nominal thickness shall not be notched unless the reduced section properties and lumber defects are considered in the design. For effects of notch on shear strength, see Section 3.4.4

13. Sec. 3.3.2. Add a last paragraph as follows: …

~~**14. Sec. 3.3.4. Add a section as follows:**~~

~~3.4.4.5 When girders, beams or joists are notched at points of support on the compression side, they shall meet design requirements for the net section in bending and in shear. The actual shear stress as such point shall be calculated as follows:~~

~~f_v = 3V divided by 2b[d – [[d – d"] / d] e]~~

~~WHERE:~~

~~d = total depth of beam.~~

~~**d' = actual depth of beam at notch.**~~

~~e = distance notch extends inside the inner edge of support.~~

~~V = shear force.~~

~~Where e exceeds d', the actual shear stress for the notched on the compression side shall be calculated as follows:~~

~~F_v = 3V divided by 2bd'~~

~~26. Sec. 13.2.1. Delete and substitute as follows:~~

~~13.2.1 Test for design values. Tests to determine design values for metal plate connectors in lateral withdrawal, net section shear and net section tension shall be conducted in accordance with the test and evaluation procedures in ANSI/TPI 1-1995. Design values determined in accordance with these test procedures shall be multiplied by all applicable adjustment factors (see Table 7.3..1) to obtain allowable design values.~~

~~27. NDS Supplement Table 5A. Add combinations and design values as follows:~~ ~~…~~

Delete Table of Design Values in Pounds Per Square Inch

Reason for amendment:

The 1991 NDS is an outdated specification, which is more than 10 years old. Since the adoption of 97 UBC the NDS has published the 1997 specifications, which incorporates many of them items that were added since publication of 1991 NDS and it is also in a more user friendly format.

Findings (based upon local geologic, topographic or climatic conditions):

The amendment is needed due to local geological conditions.

The San Francisco Bay area region is densely populated and/or located in an area of high seismic activities as indicated by United States Geological Survey and California Division of Mines and Geology. Recent earthquake activities, including the 1989 Loma Prieta earthquake, have indicated the lack of adequate design and detailing as a

contributing factor to damages that reduced the protection of the life-safety of building occupants.